

What is claimed is:

- 5 1. A wireless communication system for providing a radio frequency (RF) link between an enclosed environment that is at least substantially shielded from RF signals, and the outside of the enclosed environment, the wireless communication system comprising:
- 10 at least one gateway antenna arranged at an entrance point of the enclosed environment so as to radiate downlink RF signals into and receive uplink RF signals from, the enclosed environment, respectively;
- at least one auxiliary repeater arranged within the enclosed environment;
- 15 a donor antenna coupled to the auxiliary repeater; and  
a server antenna coupled to the auxiliary repeater;
- wherein the auxiliary repeater relays the downlink and uplink RF signals using the donor antenna and the server antenna.
- 20 2. A wireless communication system according to Claim 1, wherein the auxiliary repeater is mounted on a mobile conveyance movable in the enclosed environment with the donor antenna located outside the mobile conveyance and the server antenna located inside the mobile conveyance.
- 25 3. A wireless communication system according to Claim 2, wherein the enclosed environment is in a lift shaft, the mobile conveyance is a lift car and the gateway antenna is arranged at a ceiling of the lift shaft.

4. A wireless communication system according to Claim 2 or 3, wherein the auxiliary repeater comprises a bidirectional amplifier having a gain that is adjustable based on a distance between the mobile conveyance and the gateway antenna.

5 5. A wireless communication system according to any of Claims 1 to 4, comprising a plurality of auxiliary repeaters arranged spaced apart from each other in a cascade within the enclosed environment.

10 6. A wireless communication system according to Claim 5, wherein the plurality of auxiliary repeaters comprises a first group and a second group of auxiliary repeaters, wherein the auxiliary repeaters in the first group are mounted to respective mobile conveyances of a train of mobile conveyances movable in the enclosed environment, with the donor antenna, coupled to at least a leading auxiliary repeater or a trailing auxiliary repeater of the auxiliary repeaters in the first group, being  
15 arranged outside the mobile conveyance, the donor antennas coupled to the other auxiliary repeaters in the first group and the server antennas coupled to the auxiliary repeaters in the first group arranged inside the respective mobile conveyance, and the auxiliary repeaters in the second group are arranged to be stationary in the enclosed environment outside the mobile conveyances.

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7. A wireless communication system according to Claim 5 or 6, wherein the enclosed environment is the inside of a tunnel.

25 8. A wireless communication system according to any of Claims 5 to 7, comprising a plurality of gateway antennas arranged at respective entrance points of the enclosed environment.

9. A wireless communication system according to any one of Claims 1 to 8, further comprising:

a first interface that is coupled to a control station for converting downlink control data into corresponding downlink control RF signals and for converting uplink signaling RF signals into corresponding uplink signaling data;

5 a first combiner/decombiner that is coupled to the first interface for combining the downlink RF signals with the downlink control RF signals for transmission by the gateway antenna, and for separating uplink RF signals from the uplink signaling RF signals received by the gateway antenna;

10 a second interface that is coupled to a signaling and driving system for converting the downlink control RF signals into driver signals and for converting signaling signals into the uplink signaling RF signals; and

15 a second combiner/decombiner that is coupled to the second interface for combining the uplink RF signals with the uplink signaling RF signals for transmission by the donor antenna of the auxiliary repeater, and for separating the downlink RF signals from the downlink control RF signals received by the donor antenna of the auxiliary repeater.

10. A wireless communication system according to Claim 9, wherein the signaling and driving system is arranged in the mobile conveyance and comprises a driver for  
20 controlling the mobile conveyance based on the driver signals, and a sensor for producing the signaling signals based on a status of the mobile conveyance.

11. A wireless communication system according to Claim 10, wherein the signaling and driving system further comprises a signal generator being operable by  
25 an operator of the mobile conveyance.

12. A lift system comprising:

a lift shaft;

a lift car that is moveable within the lift shaft;

at least one gateway antenna arranged at a ceiling of the lift shaft so as to radiate downlink RF signals into and receive uplink RF signals from inside, the lift shaft, respectively;

an auxiliary repeater mounted on the lift car;

5 a donor antenna coupled to the auxiliary repeater and located outside of the lift car; and

a server antenna coupled to the auxiliary repeater and located inside the lift car;

10 wherein the auxiliary repeater relays the uplink and downlink RF signals between outside and inside of the lift car using the donor antenna and the server antenna.

13. A lift system according to Claim 12, further comprising:

15 a first interface that is coupled to a control station for converting downlink control data into corresponding downlink control RF signals and for converting uplink signaling RF signals into corresponding uplink signaling data;

20 a first combiner/decombiner that is coupled to the first interface for combining the downlink RF signals with the downlink control RF signals for transmission by the gateway antenna, and for separating uplink RF signals from the uplink signaling RF signals received by the gateway antenna;

a second interface that is coupled to a signaling and driving system for converting the downlink control RF signals into driver signals and for converting signaling signals into the uplink signaling RF signals; and

25 a second combiner/decombiner that is coupled to the second interface for combining the uplink RF signals with the uplink signaling RF signals for transmission by the donor antenna of the auxiliary repeater, and for separating the downlink RF signals from the downlink RF control signals received by the donor antenna of the auxiliary repeater.

14. A lift system according to Claim 13, wherein the signaling and driving system is arranged in the lift car and comprises a driver for controlling the lift car based on the driver signals, and a sensor for producing the signaling signals based on the status of the lift car.

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15. A lift system according to Claim 14, wherein the signaling and driving system further comprises a signal generator being operable by a user of the lift car.

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16. A lift system according to Claim 15, wherein the sensor is adapted to provide information about the location of the lift car within the lift shaft, the sensor being connected to the auxiliary repeater so that the information can be used thereby for controlling the gain of an amplifier of the auxiliary repeater, and to the first interface so that the information can be used by the control station to control the location of the lift car in the lift shaft.